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This is the author's manuscript

Original Citation:

Availability:

This version is available <http://hdl.handle.net/2318/1508580> since 2016-06-20T15:39:29Z

Published version:

DOI:10.1017/S1478951515000139

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(Article begins on next page)

This is the author's final version of the contribution published as:

Paolo Leombruni; Barbara Loera; Marco Miniotti; Francesca Zizzi; Lorys Castelli; Riccardo Torta. Confirmatory factor analysis of the Frommelt Attitude Toward Care of the Dying Scale (FATCOD-B) among Italian medical students. *PALLIATIVE & SUPPORTIVE CARE*. None pp: 1-8.
DOI: 10.1017/S1478951515000139

The publisher's version is available at:

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Title

Confirmatory Factor Analysis of the Frommelt Attitude Toward Care of the Dying scale (FATCOD-B) among Italian medical students

Short title

FATCOD-B scale psychometrics by confirmatory factor analysis

Authors

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Number of manuscript pages: 15; **Number of tables:** 3; **Number of figures:** 1

Title

Confirmatory Factor Analysis of the Frommelt Attitude Toward Care of the Dying scale (FATCOD-B) among Italian medical students

Abstract

Objectives: A steady increase in the number of patients requiring end-of-life care has been observed in the last decades. The assessment of health care students' attitudes toward the end-of-life care is an important step of their curricula as it provides information about their disposition to practice palliative medicine. The Frommelt Attitude Toward Care of the Dying scale (FATCOD-B) was properly developed to detect such disposition but its psychometric properties have not yet been clearly defined.

Methods: A convenience sample of 608 second-year medical students participated in this study in the 2012-2013 and 2013-2014 academic years. Participants completed the FATCOD-B. Sample was randomly divided in two subsamples. In the item analysis, reliability (Cronbach's alpha), internal consistency (item-total correlations) and an exploratory factor analysis (EFA) were conducted using the first subsample (N=300). Using the second subsample (N=308), confirmatory factor analysis (CFA) was performed using robust ML method in Lisrel.

Results: Reliability for the total of items was 0.699. Item-total correlations, ranging from 0.03 to 0.39, are weak. EFA identified a two-dimensional orthogonal solution, explaining 20% of the total variance. CFA upheld the two-dimensional model, but the loadings on the dimensions and their respective indicators were weak and equal to zero for certain items.

Significance of results: Findings from the present study suggest that the FATCOD-B measures a two-dimensional construct and that several items seem in need of revision. Future research oriented in building a revised version of the scale should pay attention to items ambiguity and should take particular care to distinguish among items that concern emotions and beliefs related to the end-of-life care, as well as their subjects (e.g., the health care provider, the patient, his family).

Keywords

FATCOD-B, Attitudes toward the dying, Confirmatory factor analysis (CFA), Items validity, Medical students

Introduction

About ten years ago, discussing the need to bridge the lack information about care for the dying in medical education, Frommelt posed a question: “*How can we expect people to help another deal with death and dying when they are not prepared to deal with their own feeling?*” (Frommelt, 2003). The question raised by Frommelt was clearly rhetorical and seemed to suggest an implicit answer, namely, that education in palliative care may not exempt itself from conducting the students through a process of introspection and personal growth.

In the last decade, extensive research has been conducted on end-of-life care medical education; this reflect the increasing worldwide attention to the need to improve palliative care curricula. Several interesting proposals have been put forward in the literature (Braun et al., 2013; von Gunten et al., 2012; Morrison et al., 2012; Schillerstrom et al., 2012). However, most of these proposals address the issue from a teaching perspective, rather than a learning perspective and focus on the assessment of the acquisition of interpersonal and communicative skills, while seemingly overlooking the student’s process of personal growth and attitude development. Due to this position, only a few assessment tools have been developed to assess attitudes toward death and dying (Frommelt 1991; Neimeyer, 1994; Merrill et al., 1998), and their application in research has been rather limited. Focusing on the relationship with the dying patient during care, rather than on death and dying as general concepts, the Frommelt Attitude Toward Care of the Dying Scale Form-B (FATCOD-B) (Frommelt, 1991; 2003) appears to be a useful instrument for end-of-life care education because it provides information about the behavior of the health professionals in clinical practice. The original version of the scale, named FATCOD, had been developed for nurses (Frommelt, 1991); subsequently, the FATCOD was slightly modified in FATCOD-B to be

administered to students coming from different programs of study (Frommelt, 2003). Both versions of the scale have been used in several studies investigating factors influencing the attitudes about care of the dying and evaluating the effectiveness of didactic training for end-of-life nursing care (Frommelt, 2003; Mallory, 2003; Miyashita et al., 2007; Henoch et al., 2013a; 2013b; Leombruni et al., 2014a). All of these studies come from nursing education research and, despite its potential for use in medical education, the FATCOD-B scale has rarely been administered to medical students (Leombruni et al., 2012; 2013; 2014b). A possible reason for which the scale has not been used in this population is the absence of a validation study with a sample of medical students.

The original FATCOD-B validation study, conducted with nursing students, provided scarce information about the psychometric aspects of validity and reliability of the scale and, without empirical evidence, implicitly conceptualized the instrument as a single dimension scale (Frommelt, 2003). However, even at first reading (see Table 1), the items seem unlikely to represent a one-dimensional construct. In fact, some items have a normative nature (e.g., item 12, *“The family should be involved in the physical care of the dying person”*), others relate to emotional experiences (e.g., item 3, *“I would be uncomfortable talking about death with a dying person”*) and still others reflect personal beliefs (e.g., item 2, *“Death is not the worst thing that can be happen to a person”*). Not surprisingly, recent examinations of the factor structure of the FATCOD-B have found alternatives to the single dimension conceptualization; two dimensions (Nakai et al., 2006; Henoch et al., 2013a) and even four dimensions (Leombruni et al., 2014a) have been suggested. These studies, which were data driven using variable reduction techniques such as principal component analyses, were explorative and, although compelling solutions were proposed, these have not been confirmed.

The present study examined the psychometric properties of the Italian version of the FATCOD-B by testing the functioning of the items with data from a sample of medical students and by checking the efficiency of a proposed two-dimensional model using confirmatory factor analysis (CFA). Thus, we designed this study to: 1) identify malfunctioning items (i.e., those that appear ambiguous, contain complex wording or have apparently high specificity) that increase the scale's heterogeneity and do not contribute to the definition of the construct the scale is intended to measure; 2) test the factor structure of the FATCOD-B by imposing a two-dimensional orthogonal structure for a theoretically meaningful and parsimonious scale construct.

Methods

Participants

The research participants were Italian students in their second year at the University of Turin Medical School. All participating students were properly informed about the purposes and the methods of the study and voluntarily agreed to participate. Ethical approval was obtained from the University of Turin Ethical Review Committee. The study was conducted in accordance with the latest version of principles of the Declaration of Helsinki.

Instruments

To investigate students' attitudes toward end-of-life care, the Frommelt Attitude Toward Care of the Dying Scale form B (FATCOD-B) was used (Frommelt, 2003; Mastroianni et al., 2009). The FATCOD-B is a self-administered questionnaire consisting of 30 randomly ordered items scored on a 5-point Likert-type scale. One-half of the statements are positively worded and one-half are negatively worded. The statements describe beliefs about palliative care, such as the patient's decision-making autonomy, the doctor's emotional involvement in

the patient's experience, care of the patient's family, and pain treatment. Positive items are scored as follows: 1=strongly disagree, 2=disagree, 3=uncertain, 4=agree, 5=strongly agree. Scores are reversed for negative items. The possible total score ranges from 30 to 150; higher scores indicate a more positive attitude toward the care of dying patients. The Italian version of the FATCOD-B was back translated by a native English speaker, which yielded a version equivalent to the original questionnaire.

Procedures

To standardize the administration of the self-report paper and pencil questionnaire and to increase response rates, we conducted the research at the beginning of a course on palliative care developed for second-year students by the University of Turin Medical School. Data were collected before the course began on the first day of lessons. To increase the sample size, we combined the data collected at the beginning of the present academic year (2013/2014) with the data collected at the beginning of the preceding academic year (2012/2013). There were no specified time limits for completing the questionnaire and the administration took approximately 10 minutes. Responses were confidential and collected anonymously. Each participant received an identification number when the data were entered.

Statistical analyses

Descriptive statistics were performed using IBM SPSS software version 20.0. To evaluate the psychometric properties of the FATCOD-B, the original sample was randomly divided. An item analysis was conducted using data from one subsample (N=300) to detect critical items, particularly those recognized as problematical in the recent literature (Nakai et al., 2006; Henech et al., 2013a). Scale reliability was assessed with Cronbach's alpha coefficient, while the contribution to internal consistency at the item level was evaluated by item-total

correlations. Additional evidence on items functioning was obtained through an exploratory factor analysis (EFA) on the same subset of items and with the same specifications used in previous studies (i.e., 29 items, item 10 excluded; Principal Component extraction; assumption of two dimensions and orthogonal solution) to compare this study's item reduction to the results of Japanese and Swedish studies (Nakai et al., 2006; Henoch et al., 2013a).

The EFA permits only data-driven analysis when construct dimensionality (number of factors) and structure (pattern of loadings) are empirically determined from the item correlations, rather than theoretically determined and imposed on the data. To overcome the limitations of EFA, the item validity and the factor structure of FATCOD-B were examined using confirmatory factor analysis (CFA) with data from the second subsample (N=308). Measurement models of the FATCOD-B were estimated by robust ML method in Lisrel software (version 8.72). Because a prior descriptive analysis did not show a normal multivariate distribution in either subsample, the Prelis package was used to compute the asymptotic covariance matrix to correct the ML estimations obtained using Lisrel software 8.72 (Jöreskog & Sörbom, 2004). CFA model evaluation and comparison was conducted using the Comparative Fit Index (CFI; Bentler, 1990), the Root Mean Square Error of Approximation (RMSEA; Browne & Cudeck, 1993) and the Standardized Root Mean Squared Residual (SRMR; Jöreskog & Sörbom, 1981; Bentler, 1995). Following Hu and Bentler (1999), a cut-off value close to 0.95 for CFI, close to 0.6 for RMSEA and close to 0.8 for SRMR were chosen as an efficient strategy to evaluate model fit. Furthermore, to compare non-nested models, the Consistent Akaike Information Criterion (CAIC; Akaike, 1987) and the Expected Cross-Validation Index (ECVI; Browne & Cudeck, 1989) were considered. Finally, the Satorra and Bentler scaled difference χ^2 (SB-Diff) was used to identify significant differences between specified nested models (Satorra & Bentler, 2001; 2012; 2013).

Results

Sample demographics

All the participants (N=608) completed the FATCOD-B questionnaire and indicated age and gender. Of these participants, 273 (44.9%) men and 335 (55.1%) women. The mean age of the participants was 20.5 years (SD = 1.2).

Reliability, item analysis and exploratory factor analysis of the FATCOD-B

Reliability on the total of items, measured by Cronbach's alpha index, was 0.699. Item-total correlations were low and ranged from 0.03 to 0.39. Items 25 and 2 were strongly inhomogeneous with the full scale, with item-total correlation values of 0.03 and 0.08, respectively. In addition, items 4, 8, 10, 12, 18, 23, 24, 29 and 30 had low correlations; however, the deletion of these items neither altered nor increased the homogeneity of the full scale.

- Table 1 about here -

The results of our analysis were similar to those found in the Japanese and Swedish studies; the responses could be appropriately reduced to two principal components that explained at least 20% of the variance. The amount of variance accounted for by the components was rather small, but the eigenvalues sequence suggested that the two-dimension structure was the correct solution. The two components, labeled FATCOD I_Ita and FATCOD II_Ita, contained 13 and 14 items, respectively, and there were at least 10 items with acceptable loadings (>0.3) in each component. Considering only these latest items (1, 3, 5, 7, 8, 9, 11, 13, 14, 15, 26 and 27 for the first component; 1, 4, 6, 16, 18, 20, 21, 22, 23, 28 and 30 for the second component; item 1 loaded on both components), the Cronbach's alpha index was 0.650 for the

first and 0.658 for the second component (these indices were 0.696 and 0.575 in the Swedish study). The remaining seven items (2, 12, 17, 19, 24, 25, 29) did not contribute to the factorial solution, and items 2, 12, 25 and 29 were identified as critical by the reliability analysis.

- Table 2 about here -

Confirmatory factor analysis of the FATCOD-B

Because the FATCOD-B was originally built to measure one construct, the first estimated model (M1) was congeneric, with all 30 items loaded on one factor. This model had a poor fit and did not perform satisfactorily; the fit indices did not achieve the cut-off values selected a priori (see Table 3).

A new model (M2), which complicated M1 by adding a latent dimension, yielded substantial benefits: RMSEA and SRMR were reduced to 0.05, the ratio X^2/df fell below 2, and the CFI index, although it did not reach the cut-off value, increased to 0.73 (see Table 3 for further details). In addition, M2 was more parsimonious (CAIC=1220.64) and had better than expected cross validation (ECVI=3.05) than M1 (see Table 3 for further details). An analytical appraisal found that some items were incorrectly loaded in M2: the modification indices suggested item 27 should be placed on the first factor and item 30 on the second factor, as in the results of the EFA.

- Table 3 about here -

A revised model, M2R1 had better features than M2: all fit indices improved, although the CFI index remained below the set threshold, fixed on 0.94 (see Table 3). The M2R1 solution was still unsatisfactory, not only due to low CFI value (0.78) but also because the evaluation of estimate parameters suggested that item 1 should be loaded on both factors,

and items 2, 17, 19, 24, 25 and 29 should be removed because of non-significant loadings or explained variance (R^2) less than 0.10. These items were the same identified as problematic by the EFA. A further revised model, M2R2, tested the significance of the double loading of item 1, and the Satorra-Bentler test (SB-Dif = 661.86; df = 1; $p < 0.001$) found significant differences between M2R1 and M2R2, otherwise item 1 might be correctly loaded on both factors (see Table 3 for further details). Another revised model, M2R3, omitted items 2, 17, 19, 24, 25 and 29 from the scale. The loss of information caused by item elimination yielded a measurement benefit, confirming that the omitted items were irrelevant, but the CFI remained lower than 0.9 (see Table 3) and the SRMR increased to 0.08; moreover, even though significant, the parameters expressing the relationship with the latent factors were quite weak for a few items (see Figure 1).

- Figure 1 about here -

Discussion

Overall, the findings from the present study confirm that the FATCOD-B scale construct is two-dimensional, corroborating observations from previous research (Nakai et al., 2006; Henoch et al., 2013a); however, the structure of this construct is quite weak due to items with poor validity (i.e., high levels of items measurement errors).

Descriptive analyses and Exploratory Factor Analysis

In general, the FATCOD-B scale appears to include a cluster of “poor items”, which have little variance in common. Item analysis suggests that the FATCOD-B items were not very homogeneous or related to each other. In our opinion, the correlation values highlighted what we expected from the review of the item wording and content. Several items of the scale are general and quasi-existential, others refer to beliefs about the patient or the family role in the

end-of-life care and still others pertain to emotions related to the care of the dying. Previous studies investigated the factorial structure of the FATCOD-B scale, perhaps due to the wording and content, by excluding item 10 from the analyses (Nakai et al., 2006; Henoch et al., 2013a). In the present study item 10 did not appear to be the worst item in terms of phrasing and scale homogeneity; however, we performed the EFA with item 10 excluded and with the same methods (i.e., extraction and rotation) used in previous studies in order to compare item performance. Compared to the Japanese (Nakai et al., 2006) and Swedish (Henoch et al., 2013a) factor solutions, the factor solution found in the present study seemed to have a more balanced component composition. The first component, labeled as FATCOD I_Ita, is composed of 13 items and might be prudently designated as “*Positive attitudes toward the care of the dying person*”. The second component, labeled as FATCOD II_Ita, is composed of 14 items and could be designated as “*Perception of patient- and family- centered care*”. These two components were quite similar to those identified by Nakai and colleagues (2006) and by Henoch and colleagues (2013a). However, item loading (i.e., allocation between components and size and hierarchy within each component) indicated that these dimensions were not identical. In the Swedish solution, items 4 and 24 loaded on the first component instead on the second, as in the Japanese solution. In our solution, four items loaded on the “opposite” (in reference to both previous studies) component: items 6, 29 and 30 loaded on the FATCOD II_Ita rather than on FATCOD I_Ita and item 27 loaded on the FATCOD II_Ita instead on FATCOD I_Ita.

In summary, we could argue that the items of the FATCOD-B might not be clearly focused on the construct the scale intended to measure, based on the descriptive and explorative item analysis performed in the present study. In addition, the items could be interpreted differently according to the cultural context or worse, biased by lexical noise (i.e., “patient”, “family”,

“nurse”), ambiguity (i.e., semantic generality) and content format (i.e., normative vs. emotional statements).

Confirmatory factor analysis

In this study, with the hypothetical two-dimensional factor structure of the FATCOD-B found in the present and in previous research (Nakai et al., 2006; Henoch et al., 2013a) and the cluster of malfunctioning items observed (item 10 included) in mind, we developed a set of confirmatory measurement models, specified to test the scale dimensionality and item validity. We found, from the CFA results, that, the FATCOD-B does not measure a single latent dimension, despite the original intention of the scale developer (Frommelt, 1991; 2003). The scale construct seems to be two-dimensional, although the structure is inconsistent due to the items that do not reflect the intended construct (Edwards & Bagozzi, 2000). Loadings on the two dimensions and their indicators are weak and certain items are not different from zero. The construct structure may be better defined by eliminating at least six items, but an abbreviated scale solution provided only partially satisfying measurements. Continuing to decrease items was an inefficient strategy, from both theoretical and empirical perspective; reducing the FATCOD-B to less than 22 items could result in a severe reduction of the content covered by the original scale.

Limitations

The present study had some limitations that should be considered. First, considering the absence of criterion and convergent or divergent construct related to the attitude the scale aimed to measure, this study cannot be considered a complete validation study. Second, we used a convenience sample for data gathering and this could limit the generalizability of the findings. Third, the present study is not exempt from the common bias related to the use of

self-report measures, namely, that the researcher cannot determine the extent to which the responses accurately reflect the respondents' feelings, beliefs and expectations toward their future experience, as doctors, in the care of the dying patient.

Conclusion

Despite the aforementioned limitations, the present study adds new evidences about the FATCOD-B psychometrics and factor structure. The scale measures a two-dimensional construct, and several items could be revised or even be omitted from the scale. However, when attempting to measure a multidimensional construct, the content coverage of each dimension must be preserved. Each item deleted causes a loss of content and construct validity and exposes researchers to the risk of that the abbreviated scale does not measures the construct intended in the original scale (Smith et al., 2000). Furthermore, every data driven re-specification of the model might result in attempts to solve, a posteriori and by means of statistical analyses, the problems regarding item wording and construct definition.

The original version of the scale would be used as a trace in building a revised version of the FATCOD-B, in which items may be formulated so as to avoid ambiguity and lexical noise, taking particular care to distinguish among items that concerns emotions and beliefs implied in the care for the dying, as well as their subjects (i.e., the health care provider, the patient, his family).

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